EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	6	(amorphous adj carbon) and (laser with annealing) and (continuous with wave)	US-PGPUB; USPAT	OR	ON	2006/05/16 17:29
L5	3	4 and @ad<"20031003"	US-PGPUB; USPAT	OR	ON	2006/05/16 17:35
L6	1	(amorphous adj carbon) and (laser with annealing) and (continuous with wave)	USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/05/16 17:15
L7	40	438/301,308,514,542,535.ccls. and laser and (continuous with wave)	US-PGPUB; USPAT	OR	ON	2006/05/16 17:29
L8	28	7 and @ad<"20031003"	US-PGPUB; USPAT	OR	ON	2006/05/16 17:29
L9	28	8 not 5	US-PGPUB; USPAT	OR	ON	2006/05/16 17:32
L10	3	((continuous adj wave) with laser) same (amorphous adj carbon)	US-PGPUB; USPAT	OR	ON	2006/05/16 17:34
L11	3	10 and @ad<"20031003"	US-PGPUB; USPAT	OR	ON	2006/05/16 17:33
L12	0	((continuous adj wave) with laser) same (amorphous adj carbon)	USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/05/16 17:34
L13	3	((continuous adj wave) with laser) and (amorphous adj carbon) and (anneal or annealing or (heat adj treatment) or (heat adj treated) or (heat adj treating)).clm.	US-PGPUB	OR	ON	2006/05/16 17:35
L14	0	13 and @ad<"20031003"	US-PGPUB; USPAT	OR	ON	2006/05/16 17:35

DOCUMENT-IDENTIFIER: US 20050074956 A1

TITLE: Absorber layer for DSA processing

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current application

Abstract Paragraph - ABTX (1):
A method of processing a substrate comprising depositing a layer comprising **amorphous carbon** on the substrate and then laser annealing the substrate is provided. Optionally, the layer further comprises a dopant selected from the group consisting of nitrogen, boron, phosphorus, fluorine, and combinations thereof. In one aspect, the layer comprising **amorphous carbon** is an anti-reflective coating and an absorber layer that absorbs electromagnetic radiation emitted by the laser and anneals a top surface layer of the substrate.

Summary of Invention Paragraph - BSTX (11):
[0009] Embodiments of the invention provide a method of processing a substrate comprising depositing a layer on the substrate, and then laser annealing the substrate. In one aspect, the layer comprises **amorphous carbon**. In another aspect, the layer further comprises nitrogen, boron, phosphorus, fluorine, or combinations thereof. In one embodiment, the layer is laser annealed after implanting dopant ions into the substrate.

Summary of Invention Paragraph - BSTX (13):
[0011] A substrate, processed by a method comprising depositing a layer comprising **amorphous carbon** on the substrate, and then laser annealing the substrate is also provided.

Detail Description Paragraph - DETX (3):
[0018] In one embodiment, the layer comprises **amorphous carbon** and hydrogen. In one aspect, the layer is an **amorphous carbon** layer comprising carbon atoms and hydrogen atoms. In another embodiment, the layer comprises **amorphous carbon,** hydrogen, and a dopant selected from a group consisting of nitrogen, boron, phosphorus, fluorine, or combinations thereof. In one aspect, the layer is a doped **amorphous carbon** layer comprising carbon atoms, hydrogen atoms, and dopant atoms selected from the group consisting of nitrogen, boron, phosphorus, fluorine, and combinations thereof. In all embodiments, preferably, the layer includes no metal or substantially no metal. The layer may be deposited by plasma enhanced chemical vapor deposition (PECVD) of a gas mixture comprising a

carbon source. Preferably, the carbon source is a gaseous hydrocarbon. For example, the carbon source may be propylene (C.sub.3H.sub.6). The gas mixture may be formed from a carbon source that is a liquid precursor or a gaseous precursor. In one embodiment, a liquid precursor is used to improve sidewall and corner coverage of devices or features that may be on the substrate. The gas mixture may further comprise a carrier gas, such as helium (He). The layer may be deposited to a thickness of between about 100 .ANG. and about 20,000 .ANG.. Preferably, the layer is deposited to a thickness between about 800 .ANG. and about 1500 .ANG., such as a thickness of about 1200 .ANG.. The layer may be deposited in any chamber capable of performing PECVD. In one embodiment, the layer is deposited under high density plasma conditions to enhance the gap filling capability of the layer between devices or features on the substrate. An example of a chamber that may be used is the a DSM APF chamber, available from Applied Materials, Inc., of Santa Clara, Calif.

Detail Description Paragraph - DETX (11):
[0026] In another embodiment, the layer comprises **amorphous carbon** and nitrogen. The layer may be deposited by PECVD of a gas mixture comprising the carbon source and a dopant source selected from the group consisting of a nitrogen source, a boron source, a phosphorus source, a fluorine source, and combinations thereof. Preferably, the nitrogen source is nitrogen (N.sub.2). The gas mixture may further comprise a carrier gas, such as helium (He). The carbon source may be introduced into the mixing system 19 at a rate of between about 30 sccm and about 3000 sccm, the dopant source may be introduced into the mixing system 19 at a rate of between about 30 sccm and about 5000 sccm, and the carrier gas may be introduced into the mixing system 19 at a rate of between about 160 sccm and about 5000 sccm. The layer may be deposited to a thickness of between about 800 .ANG. and about 1500 .ANG., such as a thickness of about 1150 .ANG.. During deposition, the substrate is maintained at a temperature between about 200.degree. C. and about 1500.degree. C. Preferably, the substrate is maintained at a temperature between about 400.degree. C. and about 500.degree. C. For example, the substrate may be maintained at a temperature of about 400.degree. C. The deposition pressure is typically between about 5 Torr and about 50 Torr, such as about 7 Torr.

Detail Description Paragraph - DETX (12):
[0027] After the layer is deposited on the substrate, the substrate is laser annealed. Preferably, the substrate is **laser** annealed with **continuous wave** electromagnetic radiation emitted from a **laser**. As defined herein, "continuous wave electromagnetic radiation" is radiation that is emitted continuously, i.e., not in a burst or pulse. Alternatively, the substrate may be laser annealed with pulses of electromagnetic radiation.

Detail Description Paragraph - DETX (16):
[0031] In a preferred embodiment, the continuous wave electromagnetic radiation source 202 is capable of emitting radiation continuously for at least 15 seconds. Also, in a preferred embodiment, the **continuous wave** electromagnetic radiation source 202 comprises multiple **laser** diodes, each of which produces uniform and spatially coherent light at the same wavelength. In yet another preferred embodiment, the power of the laser diode/s is in the range of 0.5 kW to 50 kW, but preferably approximately 2 kW. Suitable laser diodes are made by Coherent Inc. of Santa Clara, Calif.; Spectra-Physics of California; or by Cutting Edge Optronics, Inc. of St. Charles Mo. A preferred laser diode is made by Cutting Edge Optronics, although another suitable laser diode is Spectra Physics' MONSOON.RTM. multi-bar module (MBM), which provides 40-480 watts of **continuous wave** power per **laser** diode module.

Detail Description Paragraph - DETX (23):
[0038] After the substrate is annealed, the layer may be removed from the substrate. In embodiments in which the layer comprises **amorphous carbon or amorphous carbon** and a dopant selected from a group consisting of nitrogen, boron, phosphorus, fluorine, or combinations thereof, the layer may be removed from the substrate by an oxygen ashing process.

Detail Description Paragraph - DETX (24):
[0039] An exemplary substrate processing sequence according to an embodiment of the invention is described below with respect to FIGS. 3A-3F. A substrate 300 comprising silicon is provided, as shown FIG. 3A. A field oxide layer 302, a gate dielectric 304, and a gate electrode 306 are deposited and patterned on the substrate 300 according to conventional methods to form gate source area 303 and drain source area 305 in the substrate 300, as shown in FIG. 3B. Dopant ions are then implanted into the substrate 300 to form gate source 308 and gate drain 310, as shown in FIG. 3C. A layer 312 comprising **amorphous carbon** and optionally a dopant is then deposited according to an embodiment of the invention on the substrate 300, as shown in FIG. 3D. The substrate 300 is then laser annealed according to an embodiment of the invention, as shown in FIG. 3E. The layer 312 is then removed from the substrate, as shown in FIG. 3F, such as by an oxygen ashing process.

Detail Description Paragraph - DETX (28):
[0041] A layer comprising **amorphous carbon** was deposited on 9 silicon substrates in a PECVD chamber under the following processing conditions: 550.degree. C., 7 Torr, 700 watts RF power at a frequency of 13.56 MHz, 1200 sccm C.sub.3H.sub.6, 650 sccm He, and a spacing of 270 mils between the chamber